DOCUMENT RESUME

ED 458 008 PS 029 852

AUTHOR Van Scoter, Judy; Ellis, Debbie; Railsback, Jennifer
TITLE Technology in Early Childhood Education: Finding the Balance. By Request....
INSTITUTION Northwest Regional Educational Lab., Portland, OR.
SPONS AGENCY Office of Educational Research and Improvement (ED), Washington, DC.
PUB DATE 2001-06-00
NOTE 54p.
CONTRACT ED-01-CO-0013
AVAILABLE FROM Northwest Regional Educational Laboratory, 101 S.W. Main Street, Suite 500, Portland, OR 97204. Tel: 503-275-0666; Web site: http://www.nwrel.org/request.
PUB TYPE Guides - Non-Classroom (055) -- Information Analyses (070)
EDRS PRICE MF01/PC03 Plus Postage.
DESCRIPTORS Child Development; *Computer Uses in Education; *Early Childhood Education; Educational Technology; Program Descriptions; Research; Young Children

ABSTRACT

This booklet is the seventeenth in a series addressing current educational concerns. The booklet focuses on technology in the early childhood classroom, discussing technology and child development, technology in the curriculum, and technology-related inequities. The booklet includes a discussion of research and literature, implications for policy and practice, a description of how Northwestern educators are using technology in early childhood classrooms, and selected resources. (Contains 27 references.) (EV)

Reproductions supplied by EDRS are the best that can be made from the original document.

ED 458 008

BY REQUEST...

TECHNOLOGY IN EARLY CHILDHOOD EDUCATION: Finding the Balance

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☐ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL HAS BEEN GRANTED BY

Jerry D. Kirkpatrick

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

1

JUNE 2001

NORTHWEST REGIONAL
EDUCATIONAL LABORATORY

PS 029852

2

BEST COPY AVAILABLE

BY REQUEST...

TECHNOLOGY IN EARLY CHILDHOOD EDUCATION
Finding the Balance

JUDY VAN SCOTER
NWREL's Technology in Education Center &
Northwest Educational Technology Consortium

DEBBIE ELLIS
NWREL's Child and Family Program
JENNIFER RAILSBACK
NWREL's Planning and Program Development

JUNE 2001

NORTHWEST REGIONAL
EDUCATIONAL LABORATORY

Table of Contents

Foreword 3
Introduction 5
Background 6
Child Development 8
    What Research Says About Technology and Child Development 9
Technology in the Curriculum 14
    Using Technology for a Real Purpose 16
    Computers in the Classroom 17
    Choosing Software 18
    Other Types of Technologies 20
Addressing Inequities 22
Conclusion 25
Northwest Sampler 26
    Oregon 27
    Alaska 30
    Idaho 34
    Washington 38
Resources 43
References 44
NWREL Board of Directors 49
Acknowledgments 51

FOREWORD

This booklet is the 17th in a series of "hot topic" reports produced by the Northwest Regional Educational Laboratory. They address current educational concerns as indicated by requests for information. Each booklet contains a discussion of research and literature, implications for policy and practice, a sampling of how Northwest educators are addressing the issue, references and selected resources.

One objective of the series is to foster a sense of community and connection among educators. Another is to increase awareness of current education-related themes and concerns. Each booklet gives practitioners a glimpse of how fellow educators are addressing issues, overcoming obstacles, and attaining success in certain areas. The goal of the series is to give educators current, reliable, and useful information on topics that are important to them.

Other titles in the series include:

- Service Learning in the Northwest Region
- Tutoring: Strategies for Successful Learning
- Scheduling Alternatives: Options for Student Success
- Grade Configuration: Who Goes Where?
- Alternative Schools: Approaches for Students at Risk
- All Students Learning: Making It Happen in Your School
- High-Quality Professional Development: An Essential Component of Successful Schools
- Student Mentoring
- Peaceful Schools
- After-School Programs: Good for Kids, Good for Communities
- Parent Partners: Using Parents To Enhance Education
- When Students Don't Succeed: Shedding Light on Grade Retention
- Making Positive Connections With Homeschoolers

- Increasing Student Motivation and Engagement: From Time-on-Task to Homework
- Power of Public Relations In Schools
- Supporting Beginning Teachers: How Administrators, Teachers, and Policymakers Can Help New Teachers Succeed

Introduction

The role of technology in early childhood education, birth to age eight, is a controversial topic. Parents and educators have concerns about potential benefits or harm to young children. Critics contend that technology in schools wastes time, money, and childhood itself by speeding up the pace and cutting down on essential learning experiences (Cordes & Miller, 2000; Healy, 1998). Proponents suggest that children should have the advantages that new technologies can offer. Thoughtful observers are concerned that while exciting and potentially valuable things are happening with children and computers, we may not be using these tools in the best ways, or obtaining the results we expect (Healy, 1998; Kleiman, 2000).

The issue is sometimes presented as a simple question: Should my students, my children, use computers or not? While this question is valid the issues are broader and more complex. Computers are already in homes and classrooms, and young children are using them. The more useful question is, What are appropriate and meaningful uses of technology with children? And, since technology is being used, how can educators take advantage of the power of these tools to enhance children's learning and development, while avoiding potential problems?

Research suggests appropriate and effective uses of technology in early learning and provides guidance in selecting the tools and creating the environment essential for successful technology use. Studies point to how technology—computers and other tools such as tape recorders and cameras—can be used to support and encourage the development and learning of preschool and primary age children. The critical factor is a balanced approach to technology in learning, with thoughtful planning to provide for the important needs of childhood.

BACKGROUND

Both critics and proponents agree on the importance of the early years in a child's physical, social-emotional, language, and cognitive development. Much of the controversy revolves around the specific needs of young children, and whether technology can support those needs, or will take away from essential developmental experiences.

Knowledge of children's development and studies of children and technology use can guide understanding and inform decisions. Recent research on brain development has focused attention on the capabilities of young children, the stages and styles of learning, social-emotional development, and successful educational practice. A National Research Council study (Bransford, Brown, & Cocking, 1999) reports, "Children lack knowledge and experience, but not reasoning ability" (p. xiv). Appropriate stimuli, such as close interaction with caring adults and engaging hands-on activities, enhance the brain's development (Healy, 1998). The National Research Council study states that "early learning is assisted by the supportive context of the family and the social environment, through the kinds of activities in which adults engage with children" (p. xii). It also suggests that "a number of the features of the new technologies are consistent with the principles of a new science of learning" (p. xviii).

Two key conclusions are:

- New interactive technologies make it is easier to create environments in which students can learn by doing
- Technologies can help people visualize difficult-to-understand concepts

These are the types of uses that early childhood experts recommend as being developmentally appropriate, allowing children to create and explore. Children can now compose and record music on the computer, write programs that draw mathematical shapes on the screen, and use on-screen manipulatives to deepen mathematical understanding. Talking word processing software provides immediate spoken feedback on letter names and letter combinations to novice reader/writers as they experiment with written language. These are examples of the promise of these new tools and resources.

CHILD DEVELOPMENT

Young children have needs that are real and different from those of older children and adolescents. Children from birth to age eight are learning rapidly, using all of their senses and their entire bodies to take in sensations and experience the world around them. During this period of their lives they learn through their play and exploration across five essential developmental dimensions (Kagan, Moore, & Bredekamp, 1995). These dimensions include:

- *Social and Emotional Development.* The ability to form and sustain relationships gives meaning to learning experiences. Responsive interactions provide a sense of well-being that enables children to form attachments with others and participate positively in educational activities.

- *Language Development.* Language empowers children to participate in both the cognitive and affective parts of the educational program. Experience with written and oral language provides children with the tools to interact with others, and to represent their thoughts, feelings, and experiences.

- *Physical Well-Being and Motor Development.* A child's health is connected to preparedness for and performance in learning activities. Healthy children are able to focus on and actively engage in experiences crucial to the learning process.

- *Cognition and General Knowledge.* Children need opportunities to interact with the people and objects in their environment, and to learn from their surroundings. Experiences and interactions with peers and adults allow children to construct knowledge of patterns, understand relationships between objects or events, and learn ways to solve problems.

• *Approaches Toward Learning.* Children can be successful learners in many different ways. By understanding the predispositions and learning styles that influence a child's response to learning opportunities, adults can encourage and increase engagement.

What Research Says About Technology and Child Development

There is a substantial body of research on technology use with young children. A large portion of this research focuses on the use of computers to enhance social, language, and cognitive skills (Seng, 1998). Studies highlight the opportunities for language use and social interaction that technology offers, along with increased motivation. Computers also make possible experiences and representations that cannot take place in the real world, providing new experiences and improved understanding.

Social and Emotional Development

Technology cannot and should not replace human interaction or relationships, or take the place of activities such as reading stories together or sharing conversations with children. Properly used, however, computers and software can serve as catalysts for social interaction and conversations related to children's work (Clements & Nastasi, 1993). A classroom set up to encourage interaction and the appropriate use of the technology will increase, not impair, language and literacy development. Strategies to build socialization into computer use include placing two seats in front of the computer to encourage children to work together, placing computers close to each other to facilitate sharing ideas, and locating computers in a central spot to invite other children to participate in the activity (Clements, 1999). When used appropriately:

- Computers are intrinsically motivating for young children, and contribute to cognitive and social development (National Association for the Education of Young Children [NAEYC], 1996)
- Computers can enhance children's self-concept and improve their attitudes about learning (Sivin-Kachala & Bialo, 1994)
- Children demonstrate increased levels of spoken communication and cooperation during computer use (Clements, 1994; Haugland & Wright, 1997)
- Children share leadership roles on the computer, and initiate interactions more frequently (Clements, 1994; Haugland & Wright, 1997)

Language Development

The variety of rich experiences that promote early literacy, including conversations with caring adults, storytelling, drawing and painting, and pretend play, is critical in the development of both oral and written language (Novick, 1998). Everyday, playful experiences in print-rich environments expose children to the processes of reading and writing for real purposes (International Reading Association [IRA] and NAEYC, 1998). Technology has a place in this environment; language and literacy development are major strengths of technology use with young children through the opportunities and motivation it provides. While critics express concerns that computer use will inhibit language development and lead to social isolation (Cordes & Miller, 2000; Healy, 1998), rather than isolating children, research shows that:

- Computer play encourages longer, more complex speech and the development of fluency (Davidson & Wright, 1994).
- Children tend to narrate what they are doing as they draw pictures or move objects and characters around on the screen (Bredekamp & Rosegrant, 1994).
- Young children interacting at computers engage in high levels of spoken communication and cooperation, such as turn-

taking and peer collaboration. "Compared to more traditional activities, such as puzzle assembly or block building, the computer elicits more social interaction and different types of interaction" (Clements, Nastasi, & Swaminathan, 1993, p. 60).

Physical Well-Being and Motor Development

Fine and gross motor skills develop at varying rates, and learning to write can be tedious and difficult as children struggle to form letters. A word processor allows them to compose and revise text without being distracted by the fine motor aspects of letter formation (Davis & Shade, 1994).

Following ergonomic standards similar to those for adults can help prevent muscular-skeletal injuries and vision problems. Computer use is and should be relatively brief at this age, and limiting screen time and encouraging frequent breaks will decrease the risks.

Lack of exercise and obesity are serious problems that need to be addressed during both in-school and out-of-school hours. On a typical day children two to seven years old spend an average of 11 minutes using a computer, and more than three hours watching television and videos (Roberts, Foehr, Rideout, & Brodie, 1999). Screen time (including TV, computer, and video games) should be limited to a maximum of one to two hours per day for young children (American Academy of Pediatrics, 2000; Healy, 1999). Vigorous physical activities and play should be encouraged.

As with television monitors, electromagnetic emissions from computers are minimal. Exposure can be lessened even more by having children sit two to two and one-half feet from the monitor and allowing distance between computers.

Cognition and General Knowledge

Technology offers unique intellectual experiences and opportunities for young children. Computers allow representation and actions not possible in the physical world. For example, children can manipulate variables such as gravity or speed, and discover the resulting effects (Clements, 1999; Seng, 1998).

Research points to the positive effects of technology use on cognitive and social learning and development (Clements, 1994; Haugland & Shade, 1994). In similar studies with different ages of children, using computers along with supporting activities (e.g., manipulatives, objects that children use to help them understand concepts) provided even greater benefits than either one alone.

Compared to children in a similar classroom without computer experience, three- and four-year-olds who used computers with supporting activities had significantly greater gains in verbal and nonverbal skills, problem solving, abstraction, and conceptual skills (Haugland, 1992). Similarly, third-grade children who used both manipulatives and computer programs showed more sophistication in classification and logical thinking than children who used only manipulatives (Clements & Nastasi, 1993).

Technology use that is connected to what children already know and can build upon leads to greater motivation and self-direction. Loss of creativity can be a problem if children use drill-and-practice software. Open-ended software—software that provides opportunities to discover, make choices, and find out the impact of decisions—encourages exploration, imagination, and problem solving.

Approaches Toward Learning

Technology offers additional ways to learn, and to demonstrate learning. For some children who have unique learning styles, computers can reveal hidden strengths. At the computer, children can approach learning from a variety of perspectives and follow various paths to a goal (Clements, 1999). Poor concentration and attention problems can be addressed by limiting screen time, helping children focus on the task, and choosing software that does not employ excessively stimulating noises or constantly moving graphics.

Concerns that technology speeds up the pace of learning and cuts down on childhood can be lessened if unprogrammed playtime is included as an essential part of the child's daily routine, including any technology use. Play is important for intellectual development and, as such, should be included as a vital part of early childhood education. Used appropriately, computers can be a positive element of children's play and learning as they explore and experiment.

Technology in the Curriculum

The use of technology in the curriculum is based on the needs of the children, the focus of the curriculum, and whether the technology will add to children's educational opportunities and experiences.

The age of the child and his or her developmental stage must be taken into account when considering computer use. Two important questions need to be asked when introducing young children to anything new, including technology:

- Is it developmentally appropriate—is it consistent with how a child develops and learns, and with the child's current developmental stage?
- Will the activity benefit the child?

For very young children the answers to these questions are usually "no." Computer use for most children under age three does not have meaning for the child.

Three to Five Years, or Preschool

Children's activities and experiences with computers will evolve over time as they grow and develop. Very young children often use computers with help from an adult or older child. As they mature children use computers more independently, and the teacher's role moves from guidance toward monitoring and active facilitation.

Young children learn through exploration and discovery. If computers are used with children in kindergarten, preschool, or child-care settings, the computer should be one of many activity choices they can explore (Bredekamp & Rosegrant, 1994).

During choice time, for example, a computer center may be one of several options.

Children frequently use computers for short periods, then become interested in another activity. Three- to five-year-olds generally spend about the same amount of time at a computer as they do on other activities such as playing with blocks or drawing. They are more interested and less frustrated when an adult is present, and much of the computer use will be facilitated or mediated by the teacher, which is consistent with best practice at this level (Clements & Nastasi, 1993).

For this age the value of the computer is in its open-ended use, not in creating a product (Davidson & Wright, 1994). The teacher's role is to create an environment in which children become aware and explore, and then act to support their exploration and inquiry in many different ways. Software programs for this age group should be limited in number and appropriate for children's skill level and the intended use.

Five to Eight Years, or Primary Grades

As children become more able to read and write on their own they are not limited to icons and pictures on the screen for understanding. More opportunities for independent use become available with increasing language and literacy skills. For example, simple word processors become important educational tools as children experiment with written language.

The teacher's role is to set up the environment and activities, matching technology use to the curriculum as well as to the children's needs and interests. The teacher is less involved in directing the activities, and more involved in monitoring student activities, intervening as necessary to guide and pose questions that encourage thinking.

Using Technology for a Real Purpose

Good pedagogy and sound learning objectives should guide the choice of materials and tools, including technology, to be used in learning activities (Bredekamp & Rosegrant, 1994; Davis & Shade, 1999). "Whatever materials or tools are best suited to the activity will be used; sometimes computers are the best tool for the job, and sometimes they are not; the secret is knowing the difference" (Davis & Shade, 1999, p. 237).

Computers are powerful tools that, as with other technologies, are most beneficial when used as a natural part of the learning experience. This includes:

- Integrating computers into the classroom environment
- Using them as a part of the ongoing curriculum
- Applying their use to real problems for a real purpose (Davis & Shade, 1994)

Written language, like oral language, is learned by doing things with words in the real world, using language for a purpose (Novick, 1998). Early childhood classrooms encourage written literacy by providing materials to use in pretend play, and by encouraging children to express themselves in writing (IRA & NAEYC, 1998). Studies indicate that word-processing software encourages writing, and leads to increased motivation and improvement in writing skills.

Computers and writing programs can be used with preschool-aged children to explore written language, and their use can be successfully integrated into process-oriented writing programs as early as first grade or kindergarten (Clements & Nastasi, 1993). Such software:

- Provides critical support, or scaffolding, for young writers, enabling them to perform tasks they could not perform by themselves (Clements & Nastasi, 1993)
- Allows children to compose longer and more complex stories and worry less about mistakes (Davis & Shade, 1994)
- Facilitates positive attitudes toward writing and word processing among children from kindergarten through primary grades (Clements & Nastasi, 1993)
- Encourages students to write more, more effectively, and with greater fluency (Apple Classrooms of Tomorrow, 1995)
- Helps children gain confidence in their writing and increases motivation to write more when using computers than with paper and pencil (Clements & Nastasi, 1993)

Computers also provide students a private place for practice while learning, without fear of public failure. "Especially during the primary grades, when children are expected to acquire an acceptable level of mastery of mathematical content and literacy, the computer can serve as a supportive tool for those children who have more than average difficulty succeeding" (Bredekamp & Rosegrant, 1994, p. 59).

Computers in the Classroom

Studies show that when computers are located in the classroom, children's developmental gains from using appropriate software are significantly greater than when they are in a computer lab (Davis & Shade, 1999). Reasons cited include:

- Limited exposure to computers when they are placed in labs
- The tendency to use drill-and-practice software in labs, while more tool-oriented software is used in classrooms
- Less collaboration and peer tutoring in lab settings

Other studies offer additional support for locating computers in the classroom:

- Using a computer laboratory pulls children out of their usual setting and takes away other rich options (Bredekamp & Rosegrant, 1994)
- Using a program as whole-group instruction, common in a lab setting, denies the computer's power as an individual teaching tool (Bredekamp & Rosegrant, 1994)
- Computers within the classroom enable children to use or not use them as they wish (Davidson & Wright, 1994)

As detailed in the Social and Emotional Development section, arranging the classroom to allow and encourage conversation around the computers is essential in creating opportunities for student interaction.

Choosing Software

To allow children to reap the greatest benefits from using technology, the software must be developmentally appropriate, that is, consistent with the way children learn and develop, and support or extend the curriculum (NAEYC, 1996). Select software that:

- Is open ended and allows for active learning with students making decisions
- Involves many senses and contains sound, music, or voice
- Is controlled by the children, and allows them to explore without fear of making mistakes
- Responds to children's exploration in ways that encourage further investigation
- Reflects and builds on what children already know
- Applies to real problems with real-life connections
- Elicits excitement and so encourages language (Davidson & Wright, 1994; Davis & Shade, 1994; NAEYC, 1996)

Drawing programs and music-making programs are examples of software that may have these characteristics. Children can

create pictures and music that reflect a variety of abilities and interests, limited only by their imaginations.

Drill-and-Practice Software

Drill-and-practice or computer-assisted instruction (CAI) software, similar to electronic worksheets or flashcards, is frequently used to strengthen academic performance. This type of program should be used for limited amounts of time, not as the major focus of computer use. While such software can lead to gains in certain skills, it has not been as effective in improving children's conceptual skills (Clements, 1999). "The effectiveness of computer learning depends critically on the quality of the software, the amount of time children work with the software, and the way in which they use it. Not surprisingly, studies indicate that CAI can be effective only if teachers consider such critical features" (Clements, 1994, p. 33).

These results are consistent with evidence from educational research that does not focus on technology. Such studies suggest that "preschool programs based on child-initiated learning activities contribute to children's short- and long-term academic and social development, while preschool programs based on teacher-directed lessons obtain a short-term advantage in children's academic development by sacrificing a long-term contribution to their social and emotional development" (Schweinhart, 1997, p. 3). The child as active participant in the learning process is an important element of long-term learning gains.

Other Types of Technologies

In addition to computers, many other types of technologies can be used effectively with children. The setting, the purpose, and the developmental stages of the children will help decide the best choices for a particular situation. The technology available and commonly used in the community may also influence the choice.

Tape recorders support early literacy experiences. They allow children to listen to recorded stories or songs, or to follow along in a book as they hear it being read on tape. Children can record family stories, their own made-up stories, poems, and songs, or themselves reading aloud. When adults write down children's stories—from children's dictated words or from the tape recorder—children see how the spoken word can turn into the written word. These activities integrate all aspects of literacy: speaking, listening, reading, and writing. They help children develop their storytelling ability and an understanding of how sound translates to print. Children learn that:

- What they say can be written down
- What is written down can be read
- What others say can be written down
- They can read what others write down

(Novick, 1998)

Cameras—film, video, or digital—record students' activities while they are at work, as well as performances and special events. Children can tell a story in pictures and write or dictate captions. Photos share the learning with other students, parents, and community members. Photos can also introduce teachers and staff members to new students and families during home visits.

TV/VCRs play back videos of class activities and recordings of students. Children and families have a chance to see the results of their projects and learn from watching the performances.

Videos may be loaned to family members who were not able to attend in person.

Fax machines are a way to reach out to other schools and outside organizations, to gather information, and to keep in touch with parents. Fax machines can provide immediate feedback that keeps children involved.

Portable keyboards are lightweight, inexpensive machines that are easy to carry around and use in many different situations—in the classroom, out in the schoolyard, at home, or on field trips. They allow children (or adults who take children's dictation) to type, edit, and electronically store text. The text can be transferred to a computer for formatting and graphics if desired, or sent directly to a printer.

Addressing Inequities

An important role of the school is to address inequities in society and to help level the playing field so that all students can realize their full potential, and build the foundation for later successes in life. The National Association for the Education of Young Children states that "a decade of research on the educational use of computers in schools reveals that computers maintain and exacerbate inequalities" (NAEYC, 1996, p. 3). In early childhood, addressing these inequalities has been an important consideration in deciding when and how to add technology to the educational program.

The literature discusses three main areas of potential inequity: access, type of use, and curriculum (Warren-Sams, 1997):

Access: Access to educational technologies varies greatly both in quantity and quality. Differences in funding mean that many lower-income and ethnic-minority children have limited access to computers and are often restricted in the types of software and purposes for which they use the computer. Children need to receive the message that the ability to use technology is valuable and within reach of all students.

Type of Use: Different groups of students often use computers in different ways, and the types of learning opportunities they receive are very different. Students in underserved (poor, inner-city, and rural) communities are more likely to use drill-and-practice software and integrated learning systems, in which the computer is in control and leads the students through the lessons. Students in other communities are more likely to use computers for their own purpose in project-based, inquiry-based, and collaborative learning (Kleiman, 2000).

Low-achieving students may be given limited computer time for working on basic skills, and not allowed access to programs that promote more creativity and independent thinking. Girls may receive unequal encouragement and opportunities to become fluent users of technology. All students deserve the opportunity to benefit from using software and other forms of technology that challenge and provide rich experiences. Technology use should be a part of the curriculum, not used by only some children or as a reward for good behavior.

Curriculum: Software can support the curriculum, but may contain many biases. Teachers can avoid the use of such programs, or point out these biases as an educational strategy to counteract them. As with other learning materials, classroom software should:

- Expose children to a broad range of people who vary in customs, languages, and abilities
- Reflect the society and realistically represent diverse cultures
- Represent and portray diverse characters in pivotal roles
- Communicate the richness of the personalities and choices available for both boys and girls

Educators must consider all of the essential conditions for effective technology use when looking at equity; presence of computers alone does not ensure access.

- Purposefully plan for equal access by all children, regardless of gender, ability level, race, or socioeconomic status
- Select software programs that make children feel represented
- Choose software that allows for different learning styles and accommodates varying ability levels
- Actively monitor and manage computer use with young children

- Treat all students as capable and worthy of equal access to educational opportunities

(Kleiman, 2000; Seng, 1998; Warren-Sams, 1997)

When adults facilitate acceptance of others and model appropriate roles, and software is chosen to promote equality, technology use can contribute to children's understanding and acceptance of diversity (Haugland & Wright, 1997).

Conclusion

Technology is a tool that can provide another way for children to learn and make sense of their world. Computers can be used in developmentally appropriate ways that are beneficial to children, or they can be misused, just as blocks or any other materials can be misused. And just as pencils do not replace crayons but rather provide additional means of expression, computers, or cameras or any other forms of technology, do not replace other tools but add to the array of tools available to children to explore, create, and communicate. When used appropriately by skilled teachers, technology can support and extend learning in valuable ways and can increase educational opportunities for children. The key is finding the balance, knowing how to align the elements of a healthy childhood with the unique capabilities offered by technology.

For more information about using technology in early childhood education, visit the Early Connections Web site at www.netc.org/earlyconnections/

NORTHWEST SAMPLER

The following pages contain examples of sites around the Northwest that are using technology to support early childhood learning. These are just a few of the many excellent programs in the region and throughout the country. Educators at some sites have integrated technology into their classrooms for several years, others for a much shorter time. The scope of the use varies. Though each has a unique approach, all share the common philosophy that technology, used appropriately, can enhance children's learning. Included for each site profile is contact information, observed outcomes from the thoughtful use of technology, and tips from these educators for incorporating technology in schools.

Location

Portland Public Schools Head Start
4800 NE 74th Street
Portland, OR 97218-3824

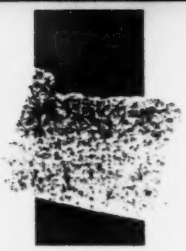
Contact

Melissa Kolb, Head Start Teacher
Phone: (503) 916-5724
Fax: (503) 916-2670
Web site: http://www.pps.k12.or.us/district/depts/headstart/

Description

Portland Public Schools Head Start has five sites in North, Northeast and Southeast Portland. Six hundred and twelve three-, four-, and five-year-old children representing 12 diverse cultures and languages are enrolled in full- and half-day sessions. The district recently received a small amount of funding specifically for technology integration. Before adding technology to their curriculum, staff members from the five sites formed a committee to answer the question, "What will be most beneficial and useful in supporting student learning?"

The committee agreed that any technology should be a tool and not a teacher, and that it should not take the place of something else in the program, or replace interaction among the children. After carefully considering the needs of the students, the current curriculum, potential uses for the teachers, and available resources, they recommended purchasing a computer, scanner, and printer for each classroom. They looked at software in light of its appropriateness for the developmental needs of young children and selected an open-ended drawing program. In addition, they purchased a digital camera for each school.



The classroom computer is available to the students as one of their choices during center activity time. Two chairs are placed in front of the computer to foster interactions and conversations. Children are encouraged to work together and share their projects. One piece of software, the drawing program, is provided, and children are encouraged to explore it in depth.

The digital camera has become a useful and versatile tool for the teachers. It is used to enhance learning in several ways:

- *To assist with the transition between home and school.* Photos of the many things children see on the first day of school (the bus and bus driver, the school entrance, the office and secretary, the class and teacher) are printed and shared with children and parents during the first home visit.

- *As a tool to help children stay on task, gain independence, and increase time management skills.* Teachers show students a picture of themselves successfully performing tasks as a reminder of what is expected. This strategy is both motivating and reinforcing to the student.

- *To enhance communication between parents and child, as well as parents and school.* Photos of activities such as zoo visits and open houses are often sent home with the students. No captions are needed, so when the children share the pictures with their families they can be discussed in the home language.

Looking ahead, the staff anticipate purchasing an additional computer for each classroom. They are also considering additional software purchases. But the priority is to get additional digital cameras, which they see as more useful and beneficial to their program.

The Portland Public Schools Head Start committee developed a philosophy statement to guide any use of technology in the classroom. This brief document sums up the reasons for their success: technology should be interactive and empowering, promote creativity, support language development and provide an opportunity for language interaction, and should be used to enhance children's learning.

Observed Outcomes

- Technology encourages communication and enhances children's language and concept development.
- Digital photos encourage child-family communication.
- Digital cameras provide personal, visual clues indicating daily routines and transitions.
- Digital cameras provide children firsthand visual clues for developing self-concept and understanding their role in social interactions with peers.
- Digital cameras document experiences with community, such as field trips and guest artists, further enriching children's connection to the world outside of school.

Keys to Success

- Consider technology as one tool among many used to enhance learning, not as a substitute for child interactions with each other, with adults, or with other modes of learning.
- Allow children to make their own choices of when and how they use technology; never force it upon them.
- Allow teachers to make their own decisions on when and how to use technology with their students.
- Involve staff in the decisionmaking process when defining technology policies.
- Have a formal committee to screen technology tools and software for the entire program.

Location

Hoonah Elementary School
P.O. Box 157
Hoonah, AK 99829

Contact

Howard Diamond, Principal
Phone: (907) 945-3611
Fax: (907) 945-3492
E-mail: howarddiamond@yahoo.com
Web site: http://www.hcs.k12.ak.us/

Description

Teachers often say that technology opens up new worlds to their students, that it brings information to their students that otherwise wouldn't be available to them. Tammy Halfacre, kindergarten teacher at Hoonah Elementary, agrees, especially considering the unique location of her school.

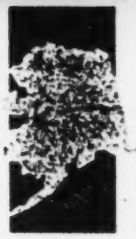
Hoonah is a community of about 900 on Chichagof Island, 40 miles west of Juneau, Alaska. Hoonah's population is about 75 percent native Tlingit. Getting to and from Hoonah can be quite involved. The only transportation is a twice-weekly ferry or small, three- to six- passenger planes that fly to Juneau and back several times a day.

Technology has provided Hoonah's children learning opportunities similar to those of children in larger communities. Besides providing access to information, technology can be used to show Hoonah's children how other children live and learn all around the country. Halfacre's students are pen pals with kindergarten classes in New Jersey and Texas. Halfacre

takes digital photos of her students and e-mails them to the other classes. The classes also have exchanged videotapes of their activities.

The children communicate with their pen pals frequently, either writing individual letters on class stationery that they created themselves, writing group letters, or using e-mail. Halfacre says on her Web site: "Starting the year writing to our new pen pals is an exciting way to introduce writing, letters, sounds, signing their name, and patterns. Later in the year this is excellent for mapping skills, social studies, and literacy lessons about letter writing."

Technology is used to celebrate student achievements. Every class at Hoonah can use a part of the hall's wall to celebrate their successes. Halfacre has covered her section with dozens of vibrant and colorful digital photos of her students. The pictures show the children doing everything from performing "Head, Shoulders, Knees, and Toes" at the Potlatch, to working on various projects. In the middle of the pictures is the caption "Look What We've Been Doing!" Halfacre takes pictures at every opportunity, and they are displayed around the school, in the monthly school newsletter, on her class Web site, and in the school yearbook. As Halfacre says, "When the children see their pictures everywhere, they have a sense of pride and ownership of their school." Sharing the pictures with parents encourages family-school-student communication, and parents are excited to see their children's accomplishments. "The kids' excitement is what prompts me to do this," says Halfacre. The pictures also give the children immediate positive feedback, because the digital pictures can be displayed instantly. The advantage to having instant pictures is especially important because it can take a week to send pictures to Juneau for developing.



Like other schools that are beginning to integrate technology into the curriculum, Hoonah's administration has supported the staff by listening to their suggestions, and giving them the resources and independence to experiment and implement their ideas. The staff is currently exploring how technology can be used for project-based, cooperative learning. The staff has encouraged the administration to use a grant to purchase a project-based learning science curriculum that utilizes computer technology. This would replace a computer lab used primarily for drill-based skills. The program builds on children's current knowledge with students working collaboratively on science activities in small groups or in pairs. The projects are correlated with the curriculum standards for kindergarten through sixth grade, and so they will enhance educational goals rather than being an add-on.

The replacement of the drill-based computer lab will be an adjustment for some. However, says John Halfacre, one of the teachers involved in the new lab, most of the staff are willing to try something new if it is aligned with the current curriculum and will benefit the students.

The staff and administration's enthusiasm for trying new ideas if they benefit the kids' whole learning is one reason this school is a wonderful learning environment. Infusing various technologies into the classroom, whether it be a digital camera, videotape, or project modules, enhances learning and encourages children to learn.

Observed Outcomes

- Photos celebrate student learning and reward their achievements. Children take pride in their work; parents take pride in their children.
- Technology promotes greater understanding of others.

- Technology brings communities closer together.
- Technology enhances communication with parents as they can see what their children are doing on the class Web site and pictures in the newsletter.
- Technology brings out children's individual strengths.

Keys to Success

- Just jump in and play with it.
- Observe other people until you get more comfortable using it yourself.
- Administration should encourage experimentation and staff to try new ideas.

Location

Fernan Elementary School
520 N. 21st Street
Coeur d'Alene, ID 83814

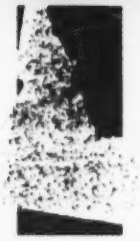
Contact

Char Soucy, First-Grade Teacher
Jim Gray, Principal
Phone: (208) 664-2659
Fax: (208) 769-2923
E-mail: csoucy@usa.net
Web site: http://www.sd271.k12.id.us/fernan/

Description

Appropriate use of technology to support learning is taken seriously at Fernan Elementary. Principal Jim Gray says in his welcoming remark on the school's Web site: "Implementing all of our available technological resources is exciting. It does not, however, displace Fernan's commitment to provide the highest quality education possible; it only enhances our efforts. As a professional educational team, we will use any tools within reach to more efficiently promote the school and hook our kids on the power of education."

This philosophy is evident in the school's focus on literacy and character education. Char Soucy, a first-grade teacher, is concerned about the negative influences that children receive daily, and envisions her students as "productive, caring members of society." In line with this vision, she teaches her students to use technology responsibly, and how to decide when technology is appropriate to use for a given purpose. She notes that technology is now part of our world and is here to stay. Her role is to teach



them the best uses of technology to support communication, build community spirit, and as a tool for learning.

Soucy keeps her focus on the curriculum and on her purpose. She uses technology with her students to help meet the curricular goals by providing resources and saving time. The children learn that sometimes technology, such as the Internet, can make information collecting faster. When they are collecting data as part of a science unit they look up information on preselected Web sites. Technology can be used during every stage of the inquiry-based learning model. In the data analysis stage, the children create slideshows using a template set up by the teacher. They import their own artwork by using a draw and paint program or by scanning in drawings. As the children work on their slides, they can decide individually which facts to highlight about the animal they studied. They use word processing to add text to the slides.

Technology supports the focus on literacy in other ways as well—social and communication skills are developed when children use technologies together. The children work together on computers most of the time. She finds the conversation and problem solving that occurs during their work to be valuable for students. As Soucy's students learn to use scanners or other technologies they teach others how to use them. "When children have to explain how to do things to someone else," says Soucy, "it reinforces the task for them. It also reinforces their verbal communication skills to have to explain it to someone else." Soucy teaches the children to explain without using their hands, relying on their words to communicate.

Soucy researches software programs to determine which are most appropriate for her students. Soucy has found that some educational programs have components that provide little educational benefit, such as coloring games. "A lot of technology isn't beneficial for children's development," she says. "Children, especially at the first-grade level, need to manipulate objects to

have a concrete model from which to develop abstract concepts," adds Soucy. Sometimes a computer simulation can do a better job, such as showing the way the heart pumps blood around the body, but sometimes it is a poor substitute for the real objects. The trick is to know which to use and when.

At the beginning of the year most of her students' experiences with computers are limited to computer games. Soucy broadens her students' view by showing them that computers are more than games, that computers can be valuable tools for learning, depending on how one uses them. Soucy likes to use this analogy with her students: The computer is a tool, just like a pencil. "I tell them explicitly—it's a tool to learn and help present what you know. The way you use it is what counts." She adds, "At first, learning how to use the computer may be the object of the lesson, but after a while, the computer should fade into the background just as a pencil and paper do."

As the year progresses, and her students learn what computers have to offer, Soucy has seen a shift in her students' attitude as they are becoming independent thinkers. While the four classroom computers are very popular with some children during "choice time," many children opt to create artwork or join writing groups. Recently, when it came time for children to choose how they wanted to present their learning, instead of deciding to create a multimedia presentation, their choice was to put on a performance for their families with songs and dances. Soucy counts this as evidence that her students are no longer viewing computers as the "best game in town," but one of many options for learning.

Fernan's school motto is "Spread Your Wings and Soar." Because of Soucy's ability to integrate technology use that enhances her students' social, character, emotional, and language development, the children are indeed soaring!

Observed Outcomes

- Children realize the value of computers to find information and enhance their learning; they no longer think of them as just games.
- When students show others how to use the tools of technology they gain confidence in their abilities.
- Communication skills improve as children articulate to classmates how to do things at the computer.
- Children need to negotiate as they work together on projects using technology, encouraging cooperation skills and consideration for others.
- Children learn to think critically and evaluate the source of information.

Keys to Success

- Software and other technology should support your educational goals, not define them. It is too easy to let the available software influence and drive your instruction, when it should always be the other way around.
- Research and preview software to cull out "time wasters" that students do not need to spend precious school time on.
- Start small. Teach a few students how to use a particular piece of software and then have those students train the next group and so on. This decreases the teacher's role as "provider of answers" and students learn to rely on each other and work together.
- Just because it can be done with technology, doesn't mean it should be.
- Young children in particular need to perform certain physical tasks for normal brain and body development.

Location

Whitson Elementary School
P.O. Box 1279
White Salmon, WA 98672

Contact

Vicki Prendergast, Principal
Phone: (509) 493-1560
Fax: (509) 493-8214
E-mail: prender@mail.wavcc.org

Description

Even before you step through the front doors at Whitson Elementary School you know that this school is all about children. Handprints of all sizes and colors cover the wall near the door, each handprint labeled with a child's name. The children have literally made their mark on this school. Once inside the school you can see and hear how enthusiastic and involved the children are in their work. Diann Beseda's second-grade classroom is alive with activity. Few of the children sit at desks. On the carpet a child sews up a paper quilt. At the computers, children try a new software program—at one computer two children work together, one child using the mouse, the other the keyboard. In another area children are spread out on the floor using pattern blocks to build shapes with symmetry. They take pictures of each other's shapes using a digital camera. In the midst of all this activity, one of the guinea pigs in the center of the room (in a cage) lets out an excited squeal, and some children come over to see why.

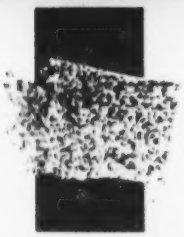
Whitson's principal Vicki Prendergast empowers the staff to use their enthusiasm and expertise to create this child-centered learning environment. The administrators and teachers have long

understood the positive benefits that technology, if integrated wisely into the curriculum, can have as a learning tool. They are motivated to apply for grants that provide more resources to carry out their goals. A few years ago the school received a TELDEC (Technology and the Essential Learnings Developing Effective Classrooms) grant. This grant provides a professional development model for using technology to support and integrate the state standards into teaching and learning. Last year, the school received a Gates Foundation Grant that will expand this model to further a child-centered, technologically-enriched educational experience in every classroom for every student.

The technology team includes the principal and five teachers. The team plans the direction the school wants to take, and provides leadership, inspiration, and support to other staff members in integrating technology into the curriculum.

The music teacher, Mary Orcutt, fills a valuable role for the team—because she teaches children in all grades, she can offer a perspective on what's appropriate for children at different levels. In her classes Orcutt takes a unique approach in using technology. The students use a music software program's paint palette to create their own songs. The program generates different sounds as the user "paints" on the computer screen. Learning how to compose music in this way is as much visual as it is auditory.

The students create songs that tie in with projects in their classrooms. For a third-grade project on insects, Orcutt has the children choose insects, and then asks the children, "What would the insect sound like? Do you want to create a sound like they make, or an impression of what they sound like?" After the children create their songs, she uses the large screen television to share each student's composition with the class. Sharing the



compositions with the class is very powerful for the students, says Orcutt.

The technology team models uses of technology for other teachers. Some staff members are uncomfortable with the idea of using technology, but the team encourages the staff to take their time, experiment, and observe others so they gradually become more comfortable with how certain technologies can benefit students.

Some of the teachers were concerned that the children were not working on oral communication, reading, and writing skills when they used computers. The technology team demonstrates how to integrate technology into writing, spelling, and oral communication, so that it can be more exciting and fun. Some teachers use software that first tells a story with the text on the screen, and then shows the pictures again, this time without the text so that children can retell the story in their own words.

Children use computer slide shows to present information, and are very eager to demonstrate their projects. The slide shows let children create their own drawings and accompanying text. The children can record their voices reading the text aloud. This enhances their literacy learning, and their verbal and written skills, as well as providing opportunities to create art. Electronic portfolios are used as an effective tool to document student progress in reading, writing, and oral communication skills. The children record samples of their reading at various times throughout the year. When they play them back, they can hear for themselves how much progress they have made. When parents hear these reading samples, says Beseda, they are excited about their child's progress.

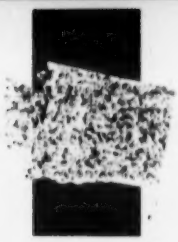
One example of how technology can enhance learning involves a boy who is bilingual and not a reader. The boy found a com-

puter program with a book on it that became his favorite—he read and listened to that program over and over again. His teacher was not quite sure if this was a good use of class time. One day the boy went to a box of books in his class and picked out the same book as on the software program and began to read it. It was the first book he had ever read. He was so excited that he went to the principal and read it to her. The teacher then saw how this technology encouraged the boy to learn.

Whitson is evidently a place where children come first, where the staff are dedicated to giving students the freedom to explore, experiment, and grow. The phrase "all children learning" is not just a cliché here, it is a fact.

Observed Outcomes

- Children are eager to learn and love learning for its own sake.
- Technology enhances whatever the children are learning.
- Children have learned that computers are just one of many sources to find information.
- Children use computers to go through the whole writing process, and are excited to see the final draft they can print out themselves.
- Children who struggle to express themselves when writing with a pencil, feel very successful when they write on a computer.
- Some activities work better with small groups. The music-writing software makes it easier to do small group activities; children can work on individual skills while others work on projects.
- Children are empowered as they learn how to use technology on their own, and then share their knowledge with the rest of the class.



- Parents can see the benefits of technology as an authentic teaching tool through electronic portfolios, slideshows, and other presentation software.

Keys to Success

- Start slow incorporating technology in your classroom. Don't worry about having to learn everything the first year—use baby steps!
- Give yourself time to work with what you've already learned.
- Sometimes expectations may be unrealistic. Don't be afraid to step back and slow down.
- Stop and evaluate your purpose for using something.
- Experiment! You will learn more by playing with something yourself than by someone else taking you through a step-by-step process.
- Remember that everyone goes through stages in learning to use technology. Not everyone has to be doing the same thing at the same time.
- Make the inservice or training sessions special and rewarding for staff.
- Allow staff to experience a variety of software so that they understand the difference between drill and practice and tools for enhancing learning.

RESOURCES

Technology and Young Children
The Technology Caucus of the National Association for the Education of Young Children, the nation's largest organization of early childhood professionals, provides research, information, and best practices regarding technology use to benefit children through age eight.
www.techandyoungchildren.org

Children and Computers
This site offers information on developmentally appropriate software and Web sites for young children, including evaluation scales, sample evaluations, and descriptions of Developmental Software Award winners. The Web site's editor, Susan W. Haugland, is well known for her work in software evaluation.
www.childrenandcomputers.com

Closing the Equity Gap in Technology Access and Use: A Practical Guide for K–12 Educators
Developed by the Northwest Educational Technology Consortium, this Web site is a practical guide to help identify and remedy inequities in technology access, types of use, and curriculum content.
www.netc.org/equity/

Computer Ergonomics for Elementary School Students (CergoS)
Designed by the Oregon Public Education Network, this Web site shows simple and affordable ways to make sure that a student's body is safe and comfortable while using a computer.
www.orosha.org/cergos/

REFERENCES

American Academy of Pediatrics. (2000). Understanding the impact of media on children and teens. Elk Grove Village, IL: Author. Retrieved February 22, 2000, from the World Wide Web: www.aap.org/family/mediaimpact.htm

Apple Classrooms of Tomorrow. (1995). *Changing the conversation about teaching, learning & technology: A report on 10 years of ACOT research.* Cupertino, CA: Apple Computer.

Bransford, J.D., Brown, A.L., & Cocking, R.R. (Eds.). (1999). *How people learn: Brain, mind, experience, and school.* Washington, DC: National Academy Press. Retrieved December 4, 2000, from the World Wide Web: www.nap.edu/openook/0309065577/html/index.html

Bredekamp, S., & Rosegrant, T. (1994). Learning and teaching with technology. In J.L. Wright & D.D. Shade (Eds.), *Young children: Active learners in a technological age* (pp. 53-61). Washington, DC: National Association for the Education of Young Children.

Clements, D.H. (1994). The uniqueness of the computer as a learning tool: Insights from research and practice. In J.L. Wright & D.D. Shade (Eds.), *Young children: Active learners in a technological age* (pp. 31-49). Washington, DC: National Association for the Education of Young Children.

Clements, D.H. (1999). Young-children and technology. In *Dialogue on early childhood science, mathematics, and technology education.* Washington, DC: American Association for the Advancement of Science, Project 2061. Retrieved November 20, 2000, from the World Wide Web:

www.project2061.org/newsinfo/earlychild/experience/clements.htm

Clements, D.H., & Nastasi, B.K. (1993). Electronic media and early childhood education. In B. Spodek (Ed.), *Handbook of research on the education of young children* (pp. 251–275). New York, NY: Macmillan.

Clements, D.H., Nastasi, B.K., & Swaminathan, S. (1993). Young children and computers: Crossroads and directions from research. *Young Children, 48*(2), 56–64.

Cordes, C., & Miller, E. (Eds.). (2000). *Fool's gold: A critical look at computers in childhood.* College Park, MD: Alliance for Childhood. Retrieved September 18, 2000, from the World Wide Web: www.allianceforchildhood.net/projects/computers/computers_reports_fools_gold_contents.htm

Davidson, J., & Wright, J.L. (1994). The potential of the microcomputer in the early childhood classroom. In J. L. Wright & D.D. Shade (Eds.), *Young children: Active learners in a technological age* (pp. 77–91). Washington, DC: National Association for the Education of Young Children.

Davis, B.C., & Shade, D.D. (1994). *Integrate, don't isolate! Computers in the early childhood curriculum* [ERIC digest]. Urbana, IL: ERIC Clearinghouse on Elementary and Early Childhood Education. Retrieved October 28, 1999, from the World Wide Web: www.ed.gov/databases/ERIC_Digests/ed376991.html

Davis, B.C., & Shade, D.D. (1999). Integrating technology into the early childhood classroom: The case of literacy learning. In D.D. Shade (Ed.), *Information technology in childhood edu-*

cation annual. Norfolk, VA: Association for the Advancement of Computing in Education.

Haugland, S.W. (1992). The effect of computer software on preschool children's developmental gains. *Journal of Computing in Childhood Education*, 3(1), 15-30.

Haugland, S.W., & Shade, D.D. (1994). Software evaluation for young children. In J.L. Wright & D.D. Shade (Eds.), *Young children: Active learners in a technological age* (pp. 63-76). Washington, DC: National Association for the Education of Young Children.

Haugland, S.W., & Wright, J.L. (1997). *Young children and technology: A world of discovery.* Boston, MA: Allyn and Bacon.

Healy, J.M. (1998, May) Understanding TV's effect on the developing brain. *AAP News: The Official News Magazine of the American Academy of Pediatrics.* Retrieved November 15, 2000, from the World Wide Web: www.aap.org/advocacy/chm98nws.htm

Healy, J.M. (1999). *Failure to connect: how computers affect our children's minds—and what we can do about it.* New York, NY: Touchstone.

International Reading Association and the National Association for the Education of Young Children (1998). Learning to read and write: Developmentally appropriate practices for young children [Joint position statement]. *Young Children*, 53(4), 30-46. Retrieved December 3, 2000, from the World Wide Web: www.naeyc.org/resources/position_statements/ psread98.pdf

Kagan, S.L., Moore, E., & Bredekamp, S. (1995). Reconsidering children's early development and learning: Toward common views and vocabulary. Goal 1 Technical Planning Group. Washington, DC: National Education Goals Panel. Retrieved November 1, 2000, from the World Wide Web: www.negp.gov/Reports/child-ea.htm

Kleiman, G.M. (2000, April–June). Myths and realities about technology in K–12 schools. *LNT Perspectives: The Online Journal of the Leadership and the New Technologies Community*, 14. Retrieved April 6, 2000, from the World Wide Web: www.edc.org/LNT/news/Issue14/feature1.htm

National Association for the Education of Young Children. (1996). *Technology and young children – ages 3–8* [Position statement]. Washington, DC: Author. Retrieved April 28, 2000, from the World Wide Web: www.naeyc.org/resources/position_statements/pstech98.htm

Novick, R. (1998). *Learning to read and write: A place to start.* Portland, OR: Northwest Regional Educational Laboratory. Retrieved May 4, 2001, from the World Wide Web: www.nwrel.org/cfc/publications/learningreadwrite.html

Roberts, D. F., Foehr, U. G., Rideout, V. J., & Brodie, M. (1999). *Kids and media @ the new millennium.* Menlo Park, CA: Henry J. Kaiser Family Foundation. Retrieved December 1, 2000, from the World Wide Web: www.kff.org/content/1999/1535/KidsReport%20FINAL.pdf

Schweinhart, L. J. (1997). *Child-initiated learning activities for young children living in poverty* [ERIC digest]. Champaign, IL: ERIC Clearinghouse on Elementary and Early Child-

hood Education. Retrieved November 20, 2000, from the World Wide Web: ericeece.org/pubs/digests/1997/schwei97.html

Seng, S. (1998, November). *Enhanced learning: Computers and early childhood education.* Paper presented at the Educational Research Association Conference, Singapore. (ERIC Document Reproduction Service No. ED 431 524)

Sivin-Kachala, J., & Bialo, E.R. (1994). Report on the effectiveness of technology in schools, 1990-1994. Washington, DC: Software Publishers Association. (ERIC Document Reproduction Service No. ED 371 726)

Warren-Sams, B. (1997). *Closing the equity gap in technology access and use.* Portland, OR: Northwest Regional Educational Laboratory.

NWREL Board of Directors

EXECUTIVE COMMITTEE

Dr. Donald Robson (Chairperson)
Dean, School of Education
University of Montana

Henry Beauchamp (Vice Chairperson)
Executive Director/CEO
Yakima Valley Opportunities Industrialization Center (Washington)

Dr. Trudy Anderson (Secretary-Treasurer)
Scholar in Residence
University of Idaho, Boise Center

Dr. Michael Jaeger, Member
Rey A. Mayoral, Member
John Pugh, Member

Olga L. Acuna
Teacher, Hillsboro School District (Oregon)

Joyce Benjamin
Representative for Oregon Superintendent of Public Instruction

Dr. Teresa Bergeson
Washington Superintendent of Public Instruction

Mike Bernazzani
Businessman, Vancouver (Washington)

Sally A. Brownfield
Teacher, Hood Canal School District (Washington)

David Chamberlain
School Board Member, Evergreen School District (Washington)

Dr. Shirley Holloway
Alaska Commissioner of Education and Early Development

Dr. Marilyn Howard
Idaho Superintendent of Public Instruction

Steven Jacquier, Teacher, Southwest Region School District (Alaska)

Dr. Michael Jaeger, Dean
School of Education and Busines, Eastern Oregon University

Rachel Lyon, Teacher
Lewiston Independent School District (Idaho)

Rey A. Mayoral, High School Principal, Salem-Keizer School District (Oregon)

Linda McCulloch
Montana Superintendent of Public Instruction

Sharon D. Parry, School Board Member
Idaho Falls School District

Myrle Peterson, Elementary Teacher,
Poplar School District (Montana)

John Pugh
Chancellor, University of Alaska, Southeast

Christopher Read, Principal
Billings Catholic Schools (Montana)

Harry Rogers, Superintendent, Retired
Petersburg (Alaska)

Barry Rotrock, Superintendent
Oregon City School District

Roger G. Wheeler
Businessman, Pocatello (Idaho)

Estella Zamora
District Court Interpreter/Coordinator, Caldwell (Idaho)

Acknowledgments

Review

NWREL Staff: Seymour Hanfling, Kendra Hughes, Rebecca Novick, Steffen Saifer
Alaska Department of Education and Early Development: Michele DeShaw

Editing

Eugenia Cooper Potter

Production

Paula Surmann

Design

Denise Crabtree

Bibliographic Review

Linda Fitch

Site Participation

Portland Public Schools Head Start in Portland, Oregon
Hoonah Schools in Hoonah, Alaska
Fernan Elementary in Coeur D'Alene, Idaho
Whitson Elementary in White Salmon, Washington

Published quarterly for NWREL member institutions

Northwest Regional Educational Laboratory
101 S.W. Main Street, Suite 500
Portland, Oregon 97204

To order additional copies of this booklet call (503) 275-0666
For questions about the By Request series call (503) 275-0454
Available on the World Wide Web at: www.nwrel.org/request

This publication is based on work sponsored wholly, or in part, by the Office of Educational Research and Improvement (OERI), Department of Education, under contract no ED-01-CO-0013 . The content of this publication does not necessarily reflect the views of OERI, the department, or any other agency of the U.S. government.

© 2001 Northwest Regional Educational Laboratory

Cover photo: Whitson Elementary School's mural of student handprints.